PATENT ABSTRACTS OF JAPAN

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(71)Applicant : MITSUBISHI ELECTRIC CORP

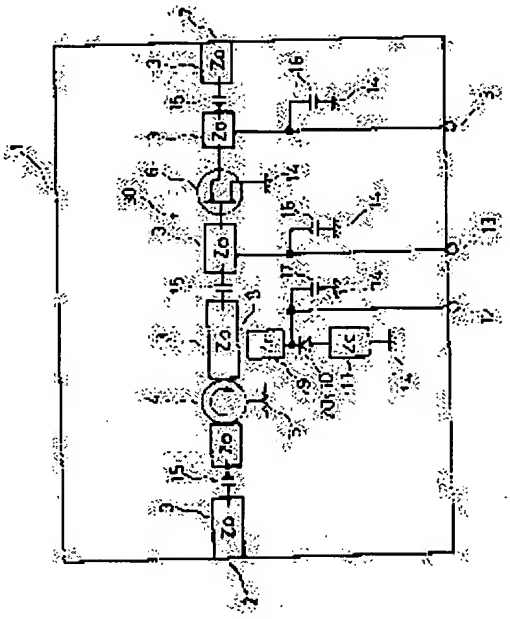
(72)Inventor : IMAMURA TAKAYUKI

(54) LOW NOISE AMPLIFIER

(57)Abstract:

PURPOSE: To suppress the level of a spurious wave inputted to a low noise amplifier by loading a series resonance circuit including a varactor diode via a narrow gap in parallel with a main transmission line of the low noise amplifier.

CONSTITUTION: A series resonator 20 is loaded in parallel with the main transmission line 3 of the low noise circuit main body 30 via a gap 8. The series resonator 20 consists of transmission lines 9, 11 and the varactor diode 10. When a desired wave is inputted from an input terminal 2 at a low level and subjected to low noise amplification by an amplifier element 6, a spurious wave with a high level is inputted from the input terminal 2 at the same time. In this case, the spurious wave is eliminated by adjusting a voltage impressed to the varactor diode 10 so as to amplify only the desired wave with low noise.



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Specification

1. Title of Invention

Low Noise Amplifier

2. Claim

A low noise amplifier that is used for a microwave band receiver, characterized by being comprised of a variable capacity diode loaded parallel to a main transmission line passage of the low noise amplifier via a narrow gap and a transmission line passage, and by providing a serial resonator circuit wherein a resonance frequency varies according to voltage charged to the variable capacity diode and a voltage charging means that charges variable voltage to the variable capacity diode.

3. Detailed Description of the Invention

[Field of Industrial Application]

This invention pertains to a low noise amplifier equipped with a wave filter for blocking a strip line variable bandwidth that is capable of easily eliminating unnecessary waves that are input to the low noise amplifier using a variable capacity diode.

[Prior Art]

As for a microwave multiplex transmitter/receiver apparatus, a noise index of the transmitting/receiving unit usually needs to be lowered. There is a variant with a built-in low noise amplifier. Since a transmitter and a receiver are conventionally inserted in the same box of the transmitter/receiver apparatus, the output of the transmitter wraparounds the receiving unit at a high level. If the wraparound occurs, the low noise amplifier is disabled. Accordingly, a waveguiding tube type bandwidth blocking wave filter is usually provided in front of the low noise amplifier. The blocking bandwidth, more specifically, the frequency range to be blocked is quickly determined by the waveguiding tube. The blocking bandwidth cannot be variable unless the waveguiding tube per se is replaced.

[Abstract of the Invention]

The present invention is produced to eliminate the disadvantages of prior art low noise amplifier. The invention also aims to offer a low noise amplifier equipped with a strip line variable bandwidth blocking wave filter, which is capable of controlling the level of undesired waves input to the low noise amplifier by reducing the charge voltage of the variable capacity diode while a serial resonator circuit containing a variable capacity diode is loaded and of varying the blocking bandwidth as needed.

[Working Example of the Invention]

A working example of the invention is described hereinbelow with reference to the drawings. Fig.1 illustrates a low noise amplifier as in the working example of the invention. In the drawing, reference number 1 refers to a strip line dielectric substrate; 2

to an input terminal; 3 to a transmission line passage at a characteristic impedance Zo, which is a main transmission line passage for the low noise amplifier; 15 to a capacity; 4 to a circulator; 5 to a non-reflective terminal end; 6 to an amplifying element; 7 to an output terminal; 13 to a voltage charging terminal; 14 to a direct short-circuiting point; and 16 to a capacity. A low noise amplifier body 30 is constituted with the above components. In addition, reference number 9 refers to a transmission line passage at a characteristic impedance Zn; 10 to a variable capacity diode; 11 to a transmission line passage at a characteristic impedance Zc; 12 to a voltage charging terminal to the variable capacity diode 10; 17 to a capacity; 14' to a direct short-circuiting point; and 20 to a serial resonator that is comprised of the components 9, 10 and 11 and that is mounted on the main transmission line passage 3 of the low noise amplifier body 30 in parallel via a gap 8. As in the working example, as not shown in the drawing, a voltage charging means for charging variable voltage is provided to the voltage charging terminal 12. Thus, the serial resonator 20 and the voltage charging means constitute the strip line variable bandwidth blocking wave filter.

Next, the operation is described.

When a desired wave fR is input from the input terminal 2 at a low level, it is amplified with the amplifying element 6 by a low noise means to be guided to the output terminal 7. As shown in Fig.2, the gain characteristic of the serial resonator 20 comprising the transmission line passage 9, the variable capacity diode 10 and the transmission line passage 11 becomes a characteristic a of Fig.2 when the charging voltage to the variable capacity diode 10 is V0-V2, a characteristic b of Fig.2 when the

charging voltage thereto is V0-V1 and a characteristic c when the charging voltage thereto is V0.

While the desired fR is input from the input terminal 2 at a low level (-100 to 10 dbm) and amplified with the amplifying element 6 by a low noise means, if an undesired wave f0 is simultaneously input from the input terminal 2 at a high level (-10 or higher dBm), the desired wave fR is controlled with the undesired wave f10, thereby not being usable. Accordingly, if voltage at V0 to V1 is charged to the variable capacity diode 10, the undesired wave f0 is reflected in front of the amplifying element 6 to be absorbed in the non-reflective terminal end 5. When the undesired wave is f0 + f2, the charging voltage of the variable capacity diode 10 can be predetermined at V0 to V1 as similarly to as described above. When the undesired wave is f0 + f1, the charging voltage of the variable capacity diode 10 can be predetermined at V0 to V2 or V0.

At the low noise amplifier as in the working example, numerous undesired waves are eliminated by reducing the charging voltage to the variable capacity diode to amplify the desired wave alone by a low noise means and also to vary the blocking bandwidth as needed. Furthermore, as the low noise amplifier is structured by the strip line means, the size is easily minimized.

[Advantageous Effect of the Invention]

As described above, according to the invention, the serial resonator circuit containing the variable capacity diode is mounted to be parallel to the main transmission line passage of the low noise amplifier via the narrow gap so as to reduce the charging voltage to the variable capacity diode, thereby controlling the level of the undesired

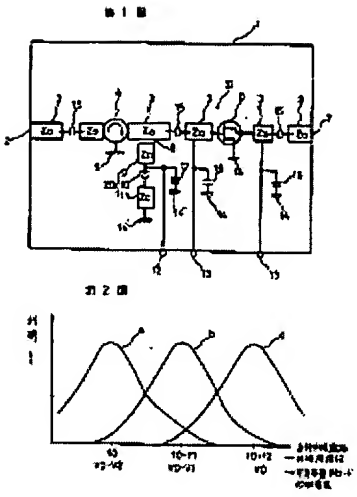
waves input to the low noise amplifier. As a result, the desired wave alone can be amplified by a low noise means, and the blocking bandwidth can be varied as needed. Moreover, as the amplifier is structured by the strip line means, the size is easily minimized.

4. Brief Description of the Invention

Fig.1 illustrates the components of a low nose amplifier as in a working example of the invention. Fig.2 is a characteristic view illustrating a serial resonator circuit of Fig.1.

In the drawings, reference number 1 refers to the strip line dielectric substrate; 2 to the input terminal; 3 to the transmission line passage at the characteristic impedance Zo; 4 to the circulator; 5 to the non-reflective terminal end; 6 to the amplifying element; 7 to the output terminal; 8 to the gap; 9 to the transmission line passage at the characteristic impedance Zn; 10 to the variable capacity diode; 11 to the transmission line passage at the characteristic impedance Zc; 12 to the voltage charging terminal to the variable capacity diode; 13 to the voltage charging terminal to the amplifying element; 14 and 14' to the direct short-circuiting points; 20 to the serial resonator circuit; and 30 to the main body of the low noise amplifier.

In the drawings, the same reference number indicates the same component or an equivalent component.



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